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EXAMINER	
HAJNIK, DANIEL F	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/811,071	FENNEY ET AL.	
	Examiner	Art Unit	
	Daniel F. Hajnik	2628	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *23 November 2007*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-3,5-12 and 14-20* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-3,5-12 and 14-20* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *26 March 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☒ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Foreign Priority Document

Acknowledgment is made of applicant's claim for foreign priority based on an application filed in the United Kingdom on 3/27/2003. It is noted, however, that applicant has not filed a certified copy of application United Kingdom 0307095.0 as required by 35 U.S.C. 119(b).

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 1-3, 5, 10-12, 14, 19, and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Redshaw et al. (GB Patent 2,343,603) in view of Deering (US Patent 6,624,823).

As per claim 1, Redshaw teaches the claimed:

1. A method for culling small objects in a system for shading 3-dimensional computer graphics images, comprising the steps of *(pg. 2, lines 6-11, "if only data pertaining **to portions of surfaces** which **are** in fact **visible** is processed. Thus, in accordance with a preferred embodiment of the invention we provide a method for **defining the edges of visible surfaces** with planes which are perpendicular to the viewing direction")*:

subdividing a display on which an image is to be viewed into a plurality of rectangular areas *(in figure 6 where a grid of areas is shown)*;

for each rectangular area deriving a list of objects in the image which may be visible in that rectangular area *(pg. 2, lines 21-23, "A **display list** of the surfaces **which fall within that tile** is used to define objects within the bounding box")*;

wherein the step of deriving a list of objects *(in figure 5, piece 32, "Object Lists")* comprises the steps of:

using the list of objects to determine how the rectangular area should be shaded for display *(in figure 5 where a tile or region has links associated with the object list of which objects should be shaded and pg. 2, lines 19-24, "in order **to render that particular object**, only **the tiles within** that particular bounding box **needs to be processed**. **A display list of the surfaces** which fall within that tile is used to define objects within the bounding box" where the rendering can include shading)*;

culling the object if the bounding box misses all the sampling points *(pg. 2, lines 24-26, "A further improvement on this method **discards the tiles within a bounding box** which do not actually contain the object to be rendered" and pg. 13, lines 9-11, "In order **to test whether a tile lies wholly on the outside** of an edge, we need only **test the point** on that corner of the tile which is closest to the edge" where this point can be a sampling point)*;

testing each sampling point against each edge of the object *(pg. 13, lines 10-11, "we need only **test the point** on that corner of the tile which is **closest to the edge**" where the edge can be part of the object and there can be a sampling point for each tile)*;

determining from the test performed by the testing step whether or not the object covers any sampling point *(pg. 13, lines 11-13, "**If that point is on the outside of the edge**, then we can be confident that the entire tile is also outside the edge" where the edge is part of the object, also see figures 4 and 9 where the object is shown)*;

adding or rejecting the object from the list in dependence on the result of the determination *(lines 28-31, "For each edge of the triangle, each tile in the rectangular bounding box must be processed in this way **to decide whether or not it should be excluded** from the minimal set" where this excluding can be the object list associated with a tile, figure 5 shows the region and object list association)*.

Redshaw does not explicitly teach the remaining claim limitations.

Deering teaches the claimed:

determining maximum and minimum values for each object in x and y directions *(in figure 13C where the object is a triangle and the maximum and minimum x and y points are found for vertices V1, V2, and V3)*;

for each object in the image, determining a bounding box from the maximum and minimum values of the x and y coordinates of the object *(in figure 13C where a "**Triangle Bounding Box**" is determined from the maximum and minimum values)*;

determining a set of sampling points from the maximum and minimum values *(col 21, lines 33-41, "determine a subset of spatial bins which, **based on their position** relation to the given triangle, **may contribute samples** that fall within the given triangle")*;

determining whether or not a bounding box surrounding the object covers any of the sampling points *(col 21, lines 34-41, "based on their position relation to the given triangle, **may contribute samples** that fall within the given triangle" where may contribute samples means considering where the triangle or object may cover any samples)*;

It would have been obvious to one of ordinary skill in the art at the time of invention to combine Redshaw with Deering. Deering teaches one advantage of the combination *(col 21, lines 37-41, "rendering unit 150A may determine the candidate bins by computing a minimal bin bounding box, i.e. a minimal rectangle of bins which efficiently contains the triangle bounding box").*

As per claim 2, Redshaw does not explicitly teach the remaining claim limitations.
Deering teaches the claimed:

2. A method according to claim 1 including the step of determining whether or not the separation of the sampling points in the x and y directions exceeds the resolution of the display; and adding or rejecting the object from the list in dependence on the result of the determination *(col 9, lines 55-63, "**samples may be filtered** to form each pixel ordinate value ... Sample buffer 162 may be configured ... **sub-sampling with respect to pixel resolution** . In other words, **the average distance between adjacent samples** in the virtual image (stored in sample buffer 162) **may be smaller than, equal to, or larger than** the average distance between adjacent pixel centers in virtual screen space" where the filtering can be the removal of objects smaller than a given pixel separation distance).*

It would have been obvious to one of ordinary skill in the art to use the claimed feature with Redshaw in order to improve the quality of display and eliminating unneeded objects that are too small to view.

As per claim 3, Redshaw does not explicitly teach the claimed limitations.

Deering teaches the claimed:

3. A method according to claim 2 in which the resolution of the display comprises the pixel separation of the display *(col 9, lines 56-57, "**Pixel** ordinate **values** may be provided to one of more of **display devices**" and col 9, lines 59-63, "In other words, the average distance between adjacent samples in the virtual image (stored in sample buffer 162) may be smaller than, equal to, or larger than **the average distance between adjacent pixel centers** in virtual screen space").*

It would have been obvious to one of ordinary skill in the art to use the claimed feature with Redshaw. The motivation of claim 2 is incorporated herein.

As per claim 5, Redshaw teaches the claimed:

5. The method according to claim 1 further including the step of, for each object, selecting only those rectangular areas which fall at least partially within the object's bounding box when determining whether or not that object is to be added to the list for a rectangular area *(in figures 7a-7d, where only the shaded rectangular areas around the bounding box of the object are considered for adding to the list and lines 28-31, "For each edge of the triangle,* ***each tile in the rectangular bounding box*** *must be processed in this way* ***to decide whether or not it should be excluded*** *from the minimal set").*

As per claim 19, Redshaw does not explicitly teach the claimed limitations.

Deering teaches the claimed:

19. The method according to claim 1 including the step of determining whether or not the sampling points are spread by more than 1 x 1 pixel and not testing the object for culling if the sampling points exceed this limit *(col 9, lines 55-56, "****samples may be filtered*** *to form each pixel ordinate value" where this filtering can be eliminating samples from objects not large enough to form a single 1x1 pixel).*

It would have been obvious to one of ordinary skill in the art to use the claimed feature with Redshaw in order to speed up the system by considering only objects large enough that can be seen on the display device.

As per claims 10-12, 14, and 20, these claims are similar in scope to claims 1-3, 5, and 19, respectively, and thus are rejected under the same rationale.

3. Claims 6, 7, 15, and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Redshaw et al. (GB Patent 2,343,603) in view of Pearce et al. (US Patent 5,809,219).

As per claim 6, Redshaw teaches the claimed:

6. A method for shading 3-dimensional computer graphics images *(in the abstract, 1st sentence, "A method and apparatus for shading 3-dimensional computer generated images")* comprising the steps of:

subdividing a display for an image into a plurality of rectangular areas *(in figure 6 where a grid of areas is shown)*;

for each object in the image determining a bounding box of rectangular areas into which the object may fall *(pg. 8, lines 7-11, "A **bounding box for a particular object** can be aligned to tile boundaries so that a list of tiles within the bounding box can then be obtained. This list of tiles is a subset of all the tiles within the screen and **approximates the tiles which intersect with the object**")*;

inserting the object in an object list for a rectangular area in dependence on the result of the determination *(lines 28-31, "For each edge of the triangle, each tile in the rectangular bounding box must be processed in this way **to decide whether or not it should be excluded** from*

the minimal set" where this excluding implies that tiles not excluded would be inserted into the list where the object does not appear, also see figure 5 which shows the tile and object list association);

Redshaw does not explicitly teach the remaining claim limitations.

Redshaw suggests the claimed:

Wherein the step of testing edge information includes the step of shifting the edge information by a predetermined amount in dependence on the orientation of each edge *(pg. 13, lines 23-27, "**The comparison of the two values** will indicate whether the point lies on the inside or outside of the edge. **The interpretation** of this result **depends on the orientation of the edge** is given in the table in Figure 9").*

It would have been obvious to specific use shifting by a predetermined amount with this teaching of Redshaw in order to simplify mathematic operations. The modification can be achieved by implementing the shifting to the edge equation shown on page 13, line 18, where for example, vertical shifting can be achieved by changing the value of "c".

Pearce teaches the claimed:

testing edge information from each object against a consistent sample point in each rectangular area to determine whether or not the object falls into each of the rectangular areas in the bounding box *(col 4, line 62 - col 5, line 2, "Within this projected 2D space, the present invention identifies the segments of time during which a sampling point is inside a moving*

polygon. More specifically, the present invention ***intersects a stationary sampling point with the moving edges of a polygon. Each of the edges*** *of the polygon* ***are examined independently.*** *In this examination, the intersection point on the edge of the polygon and the time of intersection are determined" where the moving edges can be shifting);*

It would have been obvious to one of ordinary skill in the art at the time of invention to combine Redshaw with Pearce in order to simplify the mathematics by having only a stationary point rather than one that moves. Further, the stationary point is useful in situations where the polygons move a lot such as in Pearce.

As per claim 7, Redshaw does not explicitly teach the claimed limitations.

Pearce teaches the claimed:

7. A method according to claim 6 in which the step of shifting edge information comprises shifting by either the vertical or horizontal dimension of a rectangular area *(in figure 1 which shows motion vectors associated with an edge that is shifting and col 4, lines 57-59, "one or more polygons (not shown) on object 430 are matched to the x,y coordinates of sample points 402,404" thus the motion vectors can move the edges in x (horizontal) or y (vertical) coordinate dimensions).*

It would have been obvious to one of ordinary skill in the art to use the claimed feature with Redshaw in order to simply the mathematics of the shifting process by adding or subtracting from the x and y coordinates of edge data.

As per claims 15 and 16, these claims are similar in scope to claims 6 and 7, respectively, and thus are rejected under the same rationale.

4. Claims 8 and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Redshaw et al. (GB Patent 2,343,603) in view of Pearce et al. (US Patent 5,809,219) in further view of Vatti et al. (US Patent 5,265,210).

As per claim 8, Redshaw does not explicitly teach the claimed limitations.

Vatti teaches the claimed:

8. A method according to claim 7 in which the shifting step is performed using a floating point calculation *(col 11, lines 34-36, "The **addition** of the **delta scaled values to the coordinates** of the address of the just-plotted pixel is accomplished **in floating-point format**" where this delta can be used in the shifting process as well).*

It would have been obvious to one of ordinary skill in the art to combine Redshaw, Pearce, and Vatti in order to properly calculate non-integer values that occur in the edge processing, such as edge slope values.

As per claim 17, this claim is similar in scope to claim 8, and thus is rejected under the same rationale.

5. Claims 9 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Redshaw et al. (GB Patent 2,343,603) in view of Pearce et al. (US Patent 5,809,219) in further view of Venkataraman et al. (US Pub 2002/0180729).

As per claim 9, Redshaw does not explicitly teach the claimed limitations.

Venkataraman teaches the claimed:

9. A method according to claim 6 in which the shifting step is performed with a safety margin whereby objects will be included in object lists for a rectangular area if the edge information falls close to a sampling point *(paragraph [0072], "**Cross Edge Detection**" and [0075], "The circularity can be tested by picking three points on the cross edge and **then checking if the sample points lie on a circle, within a tolerance**" where this technique can be applied to an edge of an object to be used with the object list of Redshaw and where the tolerance can be similar to a safety margin).*

It would have been obvious to one of ordinary skill in the art to combine Redshaw, Pearce, and Venkataraman in order to give better edge and sample intersection results by using a comparison test which allows a bit of tolerance.

As per claim 18, this claim is similar in scope to claim 9, and thus is rejected under the same rationale.

Response to Arguments

1. Applicant's arguments filed 11/23/2007 have been fully considered but they are not persuasive.

Applicant argues:

> This is completely different from the purpose of Redshaw's invention, which as understood is not concerned with rejecting objects from an object list corresponding to a rectangular area or tile and therefore avoiding having to

> render these objects as is the case with the instant invention, and instead is concerned with rejecting tiles which do not intersect with the object so as to avoid having to process these tiles at all.
> (top of page 10 in filed response).

The examiner respectfully maintains that the rejections are proper because the objects and tiles are directly related. For example, one small object can fit entirely into a tile, in which case any operation performed on a tile is directly related to that object as well. In addition, the tile processing of Redshaw is used for similar operations as those discussed in the current application. For example, Redshaw states, "A set of tiles can then be selected which define a bounding box for a particular object and, in order to render that particular object, only the tiles within that particular bounding box needs to be processed" (page 2, lines 17-21, emphasis added, also see figure 5). In respect to this passage, the system of Redshaw is placing emphasis on the processing of objects in the rendered scene but uses the tiles as a means for performing processing on these objects. In relation to the claimed language, i.e. the claimed step "culling the object if the bounding box misses all the sampling points", an object in Redshaw will be culled by determining whether the triangles of that object are visible or not. For example, Redshaw states "We have appreciated that any object can be modeled as a set of triangles" (page 3, lines 26-27) and states "after which further tests can be made on it to determine whether or not it is to be used to make a contribution to the image being processed" (page 5, lines 16-18). The object list is shown in figure 5. In this instance, an object will still be culled if all of the triangles of that object are determined to be not visible (such as in the case of small objects where there may be only one or two possible triangles for a given projection view).

Applicant argues:

> It is submitted that the invention taught in Deering, like Redshaw, is concerned with determining a minimum number of bins or tiles which must be rendered (although Deering does this differently than Redshaw), and not with rejecting an object from an object list from a rectangular area or tile if the object is determined to be too small such that it would not have a significant impact on the overall scene being rendered as is the case with the present invention
> (bottom half of page 11 in filed response).

The examiner respectfully maintains that the rejections are proper because the triangles of Deering can be objects in a given rendered scene (i.e. col 4, lines 46-48, "Application software may be executed by computer system 80 to display 3-D graphical objects on projection system 80"). The objects in Deering are broken down into triangles or other primitives using techniques known in the art (col 6, lines 29-37). Thus, the triangles and primitives of Deering are directly related to the objects because they represent the objects on the screen. In addition, these triangles can represent the object because the triangles represent the 3-D object as projected to a particular 2-D view (col 8, lines 2-6) where this projected view of the object is expressed through the triangles or primitives. Furthermore, Deering is primarily relied upon for teaching of the claimed bounding box and sampling techniques and not for determining whether or not an object should be rejected from an object list from a rectangular area or tile if the object is determined to be too small. This particular limitation, as argued, is taught by Redshaw.

Applicant argues:

> On the contrary, the shifting step of Claim 6 is designed to allow the use of a consistent test corner for all edges rather than moving the test point as a function of the edge, which results in lower cost implementations.
> (bottom of page 14 and top of page 15 in filed response).

The examiner respectfully maintains that the rejections are proper because for one Redshaw is not relied upon for teaching this limitation. Redshaw does not teach this limitation in their respective system because in the system of Redshaw sample test point is selected on an edge by edge basis. Second, the consistent test corner is provided by Pearce at the bottom of col 4, lines 63-66. The stationary sampling point or consistent test point of Pearce can be incorporated into Redshaw and Deering to provided further capabilities in order to teach all the claim limitations. Since, the sampling point in col 4, lines 63-64 of Pearce, is applied to an edge of a polygon projected in 2D space, it can be applied to the systems of Redshaw and Deering which also have polygons with edges projected into 2D space. In this instance, the Pearce would be compatible in the combination of prior art by applying mainly this concept of the consistent sampling point and edge shifting to all the edges of the polygons and objects in the scene of the other references.

Conclusion

1. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event,

however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Daniel F. Hajnik whose telephone number is (571) 272-7642. The examiner can normally be reached on Mon-Fri (8:30A-5:00P).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ulka J. Chauhan can be reached on (571) 272-7782. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

D. H.

DFH

Primary Examiner
A.U. 2628